WILDLIFE MANAGEMENT AND RESEARCH NOTES

INDIANA DIVISION OF FISH&WILDLIFE

No.		Date
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909	**TITLE:** Invertebrate abundance and vegetative structure within various forest opening regimes compared to wild turkey early brood habitat needs.	5/11/06

Work Plan: # 95291, 98291, 200450, and 20429; Federal Aid Study/Job No.: W-26-R-36; Job 46-G-5.

Synopsis: Invertebrate biomass and vegetative cover were examined on forest openings under different vegetative management regimes and mature forest sites during the early summer brood period for eastern wild turkeys (*Meleagris gallopavo silvestris*). Invertebrate biomass and vegetative cover were examined on forest openings under different vegetative management regimes and mature forest sites during the early summer brood period for eastern wild turkeys.
Data were collected in south-central Indiana during a 6-week period from late-May to early July, 1992-94. Forest opening (OP) treatments examined were the traditional opening maintenance (primarily mowing) conducted by the Forest Wildlife Project (FW), traditional FW opening management with grass-legume plantings (FWGL), munitions storage bunkers on a military base (Bunkers), warm season grasses and forbs mowed and/or burned (WSMB), and native forbs and grasses maintained by burning (NFGB). Mature forest (MF) sites were located in forest stands > 50 yr. Three sites of Special Interest (SI) also examined were a hayfield (Hay), a dry-ridge barren (Barren), and a yellow tulip poplar (*Liriodenron tuliperfera*) plantation (Tulip).

Invertebrate biomass differed between vegetative management treatments by year ($P < 0.01$). However no single treatment supported the highest biomass each year. The greatest mean invertebrate biomass in forest opening treatments was in FWGL, followed by Bunker, FW, WSMB, and NFGB **(Fig. 1).** The overall mean invertebrate biomass was consistently lowest on MF sites that were 6 times lower ($P < 0.01$) than the combined OP treatments **(Fig. 2).** Invertebrate biomass on the Hay site was 3.5 times greater than the best vegetative opening treatment (FWGL; $P < 0.01$) and 26 times greater MF sites ($P < 0.01$). Invertebrate biomass on the Barren site was within the range of values for opening sites **(Fig. 3)** while invertebrate biomass on a Tulip plantation was halfway between OP and MF ($P < 0.01$). Mowed sites had a greater ($P < 0.01$) invertebrate biomass than sites with a history of burning maintenance **(Fig. 4).**
Homopterans, Hemipterans (primarily suborder *Heteroptera*), and *Coleopterans* were generally the most prevalent individuals found in samples from OP while the number of *Orthopterans* was exceptionally high on the highly productive Hay site. *Dipterans* and *Hymenopterans* were the most prevalent in samples from MF sites.

Herbaceous cover (< 1m tall) was consistently greater ($P < 0.05$) on NFGB sites followed by FW, FWGL, WSMB, Bunker, and MF sites **(Fig. 5).** All woody vegetative parameters were considerably greater ($P < 0.01$) on MF sites **(Fig. 6**). Green herbaceous cover (0-4 dm) represented herbaceous biomass available for invertebrates at the feeding level of poults and protective overhead cover for poults. The lower 4 dm blocks (0-4 dm; 0-16 in) were also intended to reflect the available invertebrate feeding zones and protective cover for wild turkey poults during the brood period (**Fig. 7**). Herbaceous cover (0-4 dm) was the greatest on NFGB sites but similar to FW and FWGL. Herbaceous cover for all vegetative treatments was greater during the 1994 field season ($P < 0.05$). Herbaceous cover < 4 dm on OP was 3 times greater than on MF ($P < 0.01$) but the differences progressively lessened with herbaceous cover > 4 dm tall. Green (live) herbaceous cover differences occurred among OP treatments ($P < 0.01$). Green herbaceous cover on mowed and burned sites was similar ($P < 0.05$). Ground cover estimates were quite variable among vegetative treatments but only a few differences detected ($P < 0.05$). Herbaceous cover for the Special Interest areas generally fell within the range of values for the main vegetative treatments **(Fig. 8)** with herbaceous cover 5-10 dm completely lacking on the Hay fields.

Invertebrate biomass was positively correlated with vegetated ground ($P < 0.02$) and herbaceous cover, especially < 4 dm in height ($P < 0.05$). However, vegetative treatments that produced higher or lower amounts of herbaceous cover did not necessarily support corresponding higher or lower invertebrate biomass. Invertebrate biomass was negatively related ($P < 0.05$) to all shrub and tree cover parameters. Soil fertility variables showed little or no relationship ($P > 0.05$) to invertebrate biomass.

The 4 main vegetative treatments (FWGL, FW, NFGB, and WSMB) of forest openings commonly used on public forest lands in Indiana will potentially provide adequate brood and sufficient invertebrate biomass if management is implemented as

prescribed. The FWGL sites were superior over other vegetative treatments in providing both invertebrate biomass and herbaceous cover. Given annual variation in invertebrate biomass, variation in vegetative structure, and limitations inherent to each vegetative treatment (e.g. short burning window), it would be prudent to utilize all 4 treatments where appropriate to assure a diversity of opening habitats. From strictly a potential average invertebrate biomass perspective without consideration for relative distribution across the landscape, every 10 ha of FWGL would be equal to 12 ha of FW, 15 ha of NFGB, and 19 ha of NFGB. To provide quality habitat for wild turkey broods, it would be prudent to utilize all 4 OP treatments to assure adequate invertebrate foods and habitat structure. Invertebrate biomass may have been influenced by annual differences in the growing-degree-days and the timing of vegetative management.

While this study did not evaluate financial costs of each vegetative treatment, based on intuition and studies that did assess relative maintenance costs, the differences in costs to benefits would normally not favor the FWGL treatment over the others unless the amount of area dedicated to permanent forest openings was restrictive. FWGL treatments are often implemented, as either an initial phase of forest opening development or for other management objectives, including more intense game management where the demand for hunter based recreation is high. In the case of all treatments, if vegetative maintenance is not implemented as prescribed, the value as a forest opening fades with time and the remedial costs to eliminate or reduce encroaching woody vegetation (e.g. chain-saw work, larger mowing equipment, dozing) will inherently raise all vegetative treatment costs. It would appear beneficial to incorporate periodic light soil disturbance by strip disking or low depth "root raking" either post mowing or burning and the selective use of herbicides to both reduce undesirable vegetation and enhance the vegetative diversity within the openings.

Bunkers and Hay sites provided adequate invertebrate biomass but protective cover was often lacking due to other vegetative management priorities. The value of these sites for wild turkey broods increases substantially as their distribution within the landscapes increases. The wide distribution favorably mitigates some of the habitat losses due to mowing or cropping. The delay of either mowing on Bunker sites until mid-July or the cropping of hay fields until after July 1 would certainly enhance the amount of early brood cover overall.

The literature is replete with evidence supporting the importance of forest clearings for wild turkey production. The value of invertebrate foods for amphibians, reptiles, mammals, and birds is intuitive. As demonstrated in other research studies, wildlife managers should not depend on natural disturbance to create the needed opening habitat. Anthropogenic disturbance of vegetation in forested landscapes, or the lack thereof, will play a definitive role in determining brood habitat availability and population levels of wild turkeys in forested landscapes, especially on public forestlands.

The complete results of this study (including 16 data Tables and 17 Figures) will be published in the annual progress and final reports for Pittman-Robertson Federal Aid to Wildlife Research in Indiana (W-26-R).

Citation: Backs, S.E. and L. W. Bledsoe. 2006. Invertebrate abundance and vegetative structure within various forest opening regimes compared to wild turkey early brood habitat needs - Final Report. Pittman-Robertson Federal Aid to Wildlife Research (W-26-R-36; Job 46-G-5), Division of Fish and Wildlife, Indiana Department of Natural Resources, Indianapolis. 52 pp.

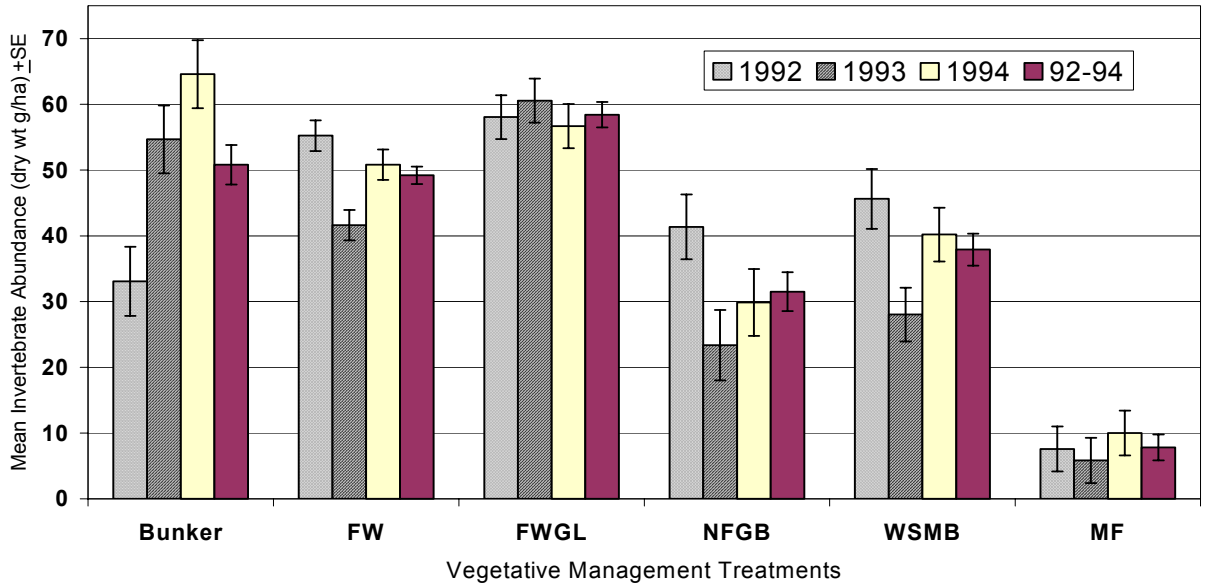

Figure 1. Invertebrate biomass (dry wt g/ha) observed under various vegetative management treatments in south-central Indiana, 1992-94. Treatment types: Bunkers = Bunker Areas Crane Naval Base, FW = Forest Wildlife Traditional Opening Management, Forest Wildlife with grass-legume mixtures, NFGB = Native forbs and grasses burned, WSMB = Warm season grasses mowed or burned, and MF = Mature forests.

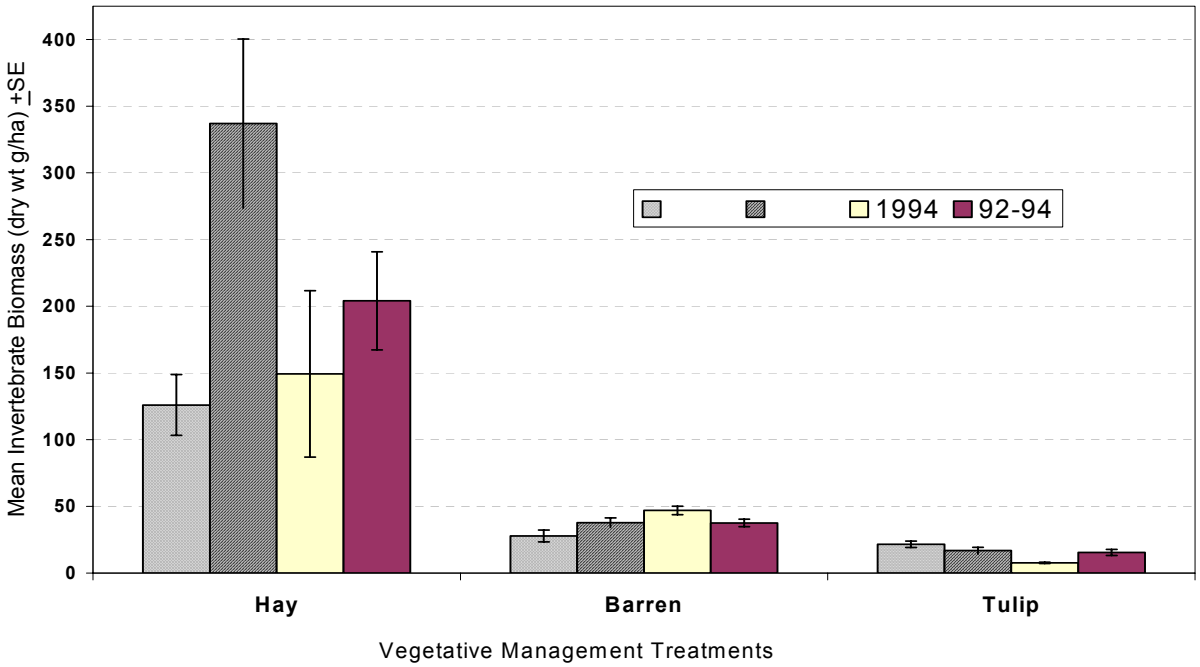

Figure 2. Invertebrate biomass (dry wt. g/ha) for Special Interest sites in south-central Indiana, 1992-94.

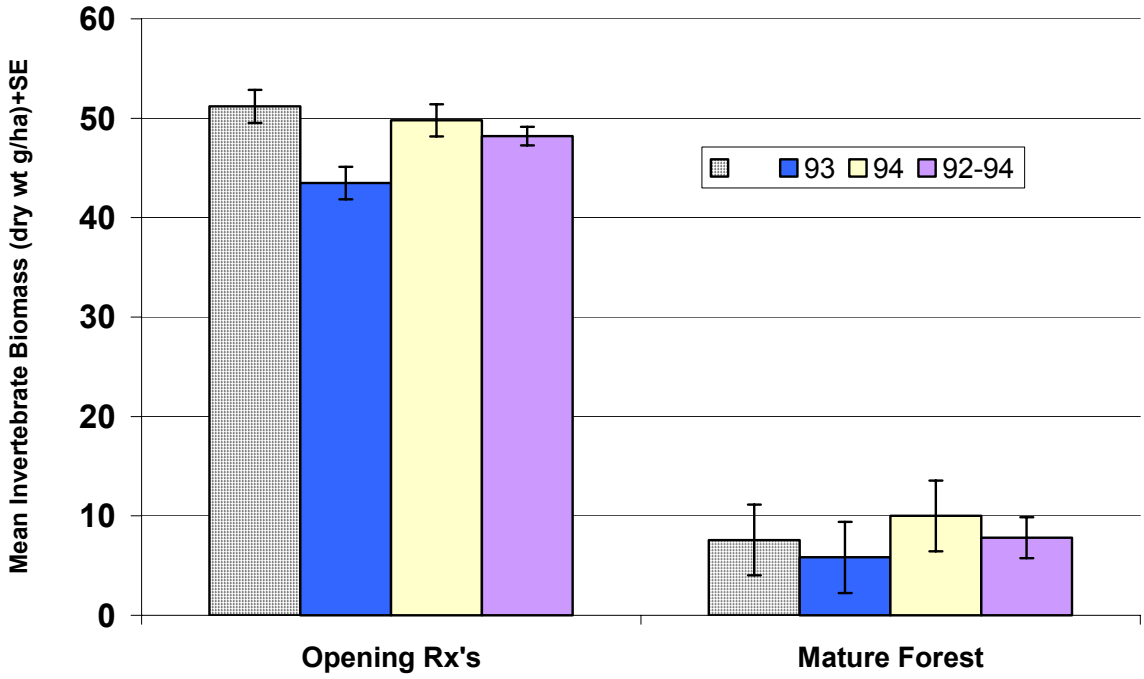

Figure 3. Invertebrate biomass in openings and mature forest sites in south-central Indiana, 1992-94.

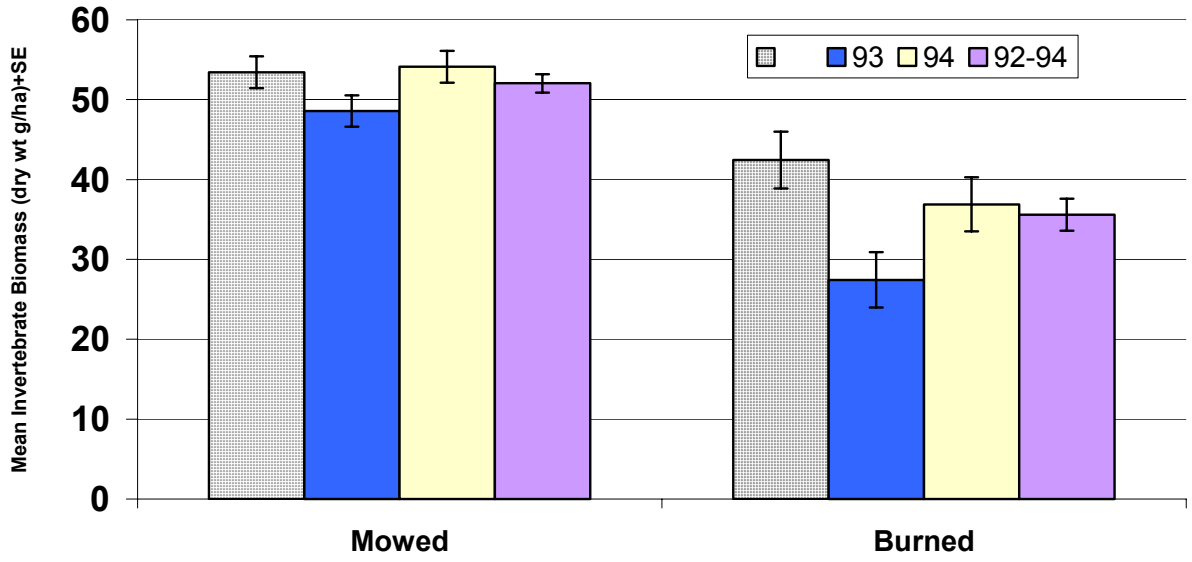

Figure 4. Invertebrate biomass forest openings that are mowed and those with a burning history in south-central Indiana, 1992-94.

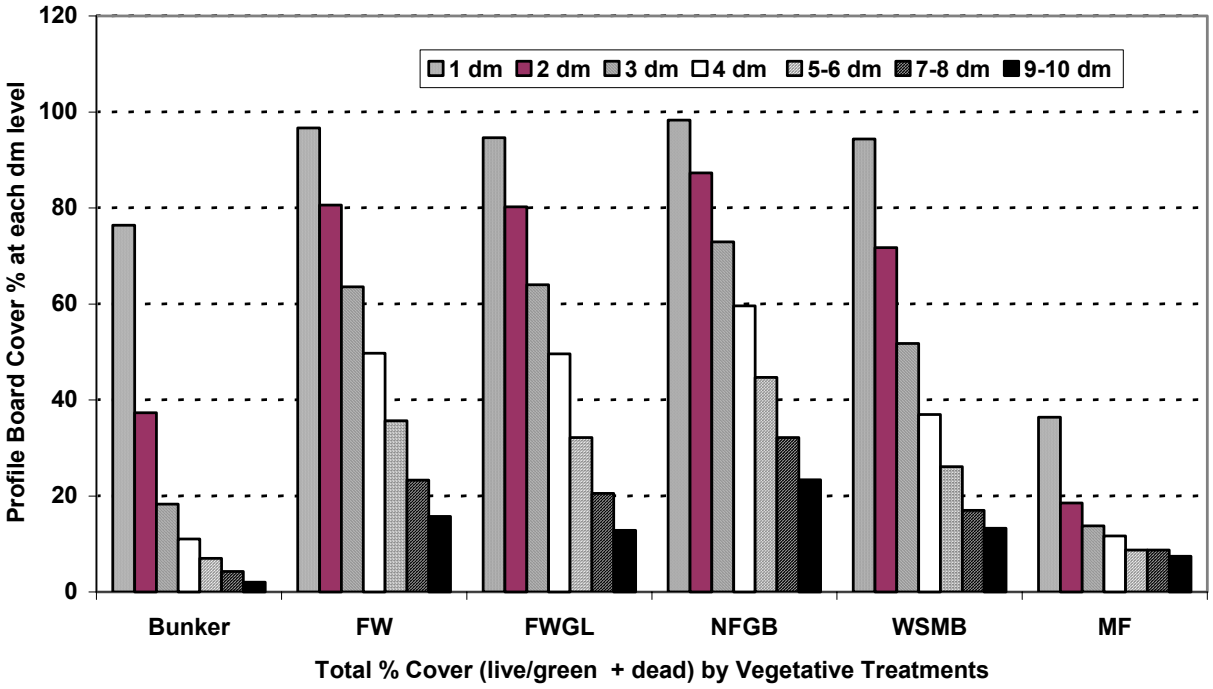

Figure 5. Total herbaceous cover estimates from a 1 m profile board for opening and mature forest sites in south-central Indiana, 1992-94.

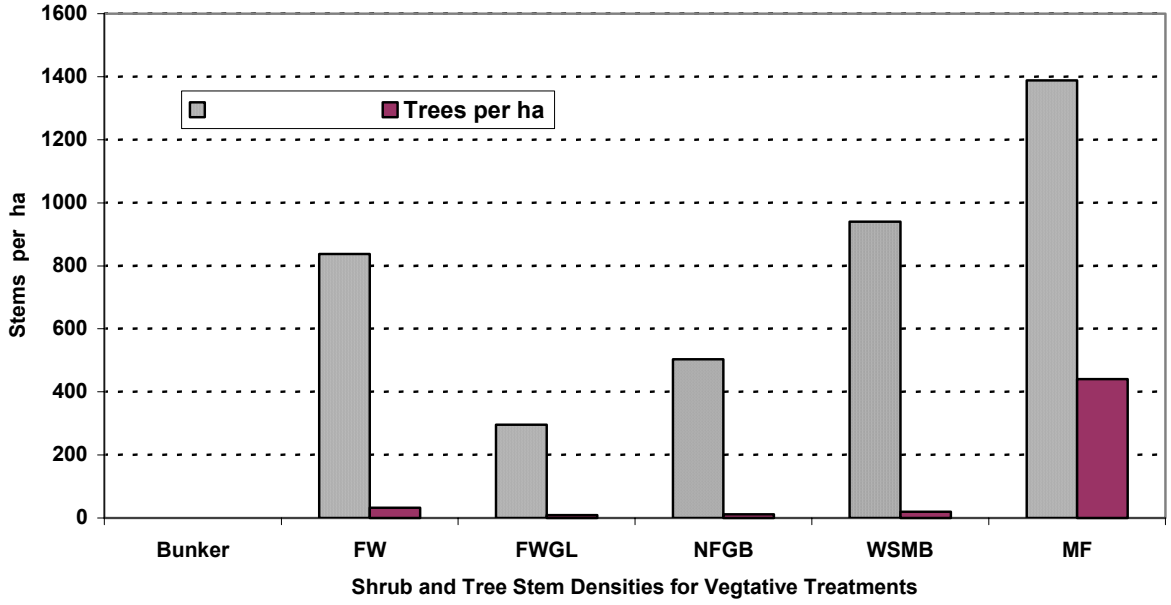

Figure 6. Shrub and tree stem densities for opening vegetative treatments and mature forest sites in south-central Indiana, 1992-94.

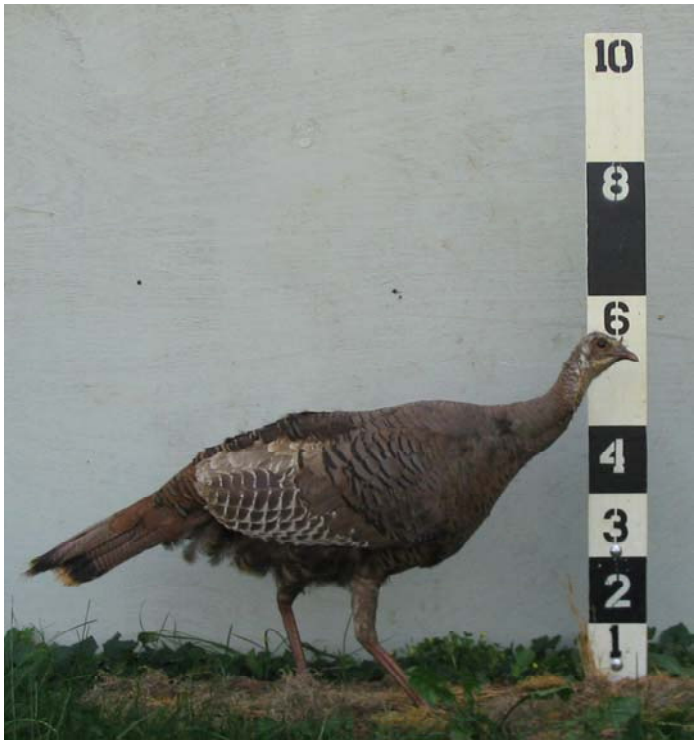

Figure 7. Wild turkey hen next to 1 m profile board (dm levels indicated) used to estimate herbaceous cover; 0-4 dm tall = potential brood levels and protective cover, > 4 dm tall = overhead surveillance level for hen.

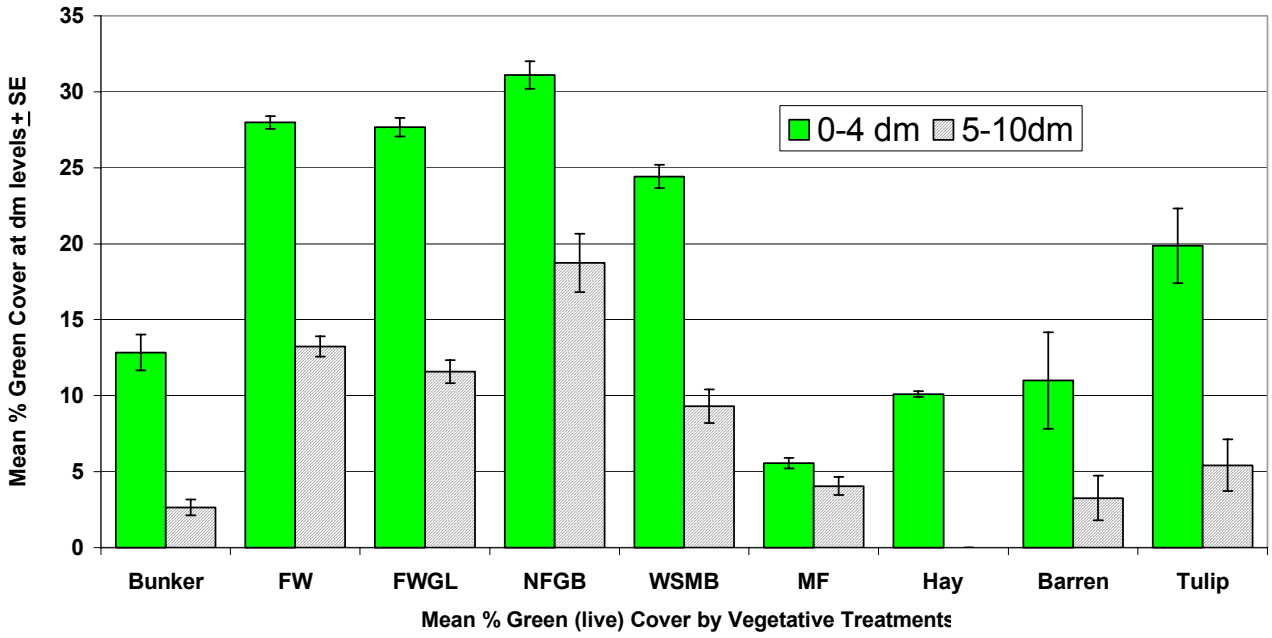

Figure 8. Profile board (1 m) estimates of percent green herbaceous (live) cover for two collective dm levels by vegetative management treatments in south-central Indiana, 1992-94.